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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

Memorandum

Subject: Atrazine Dietary Exposure: (1) Additional Calculations of Anticipated Residues in Milk and Red Meat; (2) Response to SRB Questions Regarding Whether a DCI for Market Basket Survey Data is Needed.
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In our dietary exposure assessment for atrazine (M. Metzger, 9/14/88), we calculated anticipated residues for atrazine in milk and red meat based on the highest average atrazine residues in cattle feed items. In order to more accurately describe residues of atrazine likely to be found in cattle commodities as a result of atrazine use on cattle feed items, we will calculate anticipated residues based on typical national residue intake by cattle.

Additionally in this review, we will address questions from Special Review Branch regarding the need for "market basket", other types of monitoring data, or other data to further refine the dietary exposure assessment for atrazine.

Anticipated Residues in Milk

In our previous dietary exposure assessment for atrazine, we estimated the likely dietary burden to dairy cattle based on average atrazine residues in the feed items bearing highest

atrazine residues (M. Metzger, 9/14/89, p. 39). This cattle diet could be consumed in some localities but would not be typical of cattle diets nationally. In this review we will call this a "local milk shed" diet. This diet is shown below.

Commodity	Percent (%) in Diet	Dietary Residue Contribution (ppm)
Sugarcane, molasses	10	0.026
" , bagasse	5	0.019
Sorghum, grain	35	0.032
" , forage	50	0.707
Total---->	100	0.784

In order to estimate typical atrazine residues likely to result in milk on a national basis, we provide below the residue intake for dairy cattle based on average atrazine residues in feed items which are more representative of cattle diets nationally (called "typical national diet".)

Commodity	Percent (%) in Diet	Dietary Residue Contribution (ppm)
Grass	50	0
Corn, silage	10	0.010
Corn, grain	40	0.028
Total---->	100	0.038

Using this typical national dietary residue burden for cattle, and extrapolating from a residue value of 0.03 ppm in milk resulting from 3.75 ppm dietary intake by dairy cattle as in our previous review, we estimate an anticipated residue of atrazine in milk of 0.0003 ppm.

In summary, we estimate that the following residues of atrazine are likely to result in milk from dairy cattle ingestion of animal feed items treated with atrazine:

Anticipated Residues of Atrazine in Milk

Typical National Diet.....0.0003 ppm
Local Milk Shed Diet.....0.004 ppm

We note that average residue values (from field trial data), corrected for percent crop treated, were used to calculate dietary residue intake for dairy cattle in estimating the "local milk shed"

and "typical national" anticipated residues in milk. Although dairy cattle may ingest residues higher than these values, or no residues at all, these values represent our best estimate of atrazine residues likely to be ingested. The anticipated residues for milk represent our best estimate of atrazine residues likely to be found in milk.

Anticipated Residues in Red Meat

As for milk, we will provide a cattle diet based on typical national intake of atrazine residues by cattle so that typical national exposures to atrazine from red meat may be determined. Cattle diets could consist of 0.056 ppm atrazine residues based on 80% corn grain (0.056 ppm) and 20% grass (0 ppm). Utilizing the cattle feeding study discussed in our previous review (ibid.), we calculate a typical national anticipated residue for exposure to cattle from atrazine-treated feeds, of 0.001 ppm for the meat, fat and meat by-products (except liver) of cattle, goats, hogs, horses and sheep; and 0.002 ppm for the liver of cattle, goats, hogs, horses and sheep. We summarize the likely combined residues of atrazine and its chloro-metabolites in red meat below. We note that these levels and the levels estimated for milk do not consider residues of the hydroxy metabolites of atrazine.

Commodity	Anticipated Residue (ppm) Typical National	Local
Meat, fat and meat by-products (except liver) of cattle, goats hogs, horses, and sheep	0.001	0.01
Liver of cattle, goats, hogs, horses and sheep	0.002	0.02

Data Required for More Refined Dietary Exposure Assessment for Atrazine

In a Tolerance Assessment System (TAS) review by J. R. Tomerlin (6/7/89), the oncogenic risks from dietary exposure to atrazine were calculated. These are shown in Table 1 (shown from the highest to lowest calculated oncogenic risk). Based on this information, further refinement of anticipated residues would be necessary primarily for the top six commodities in the list since the total oncogenic risk from pineapples, popcorn, wheat and macadamia nuts is $6.6396 * 10^{-7}$.

Table 1: Atrazine Oncogenic Risk (Highest to Lowest by Commodity)

Commodity	Risk	% of Total Risk
Water	$2.2 * 10^{-5}$	39.330
Sugarcane	$1.1 * 10^{-5}$	19.486
Milk	$9.3 * 10^{-6}$	16.479
Corn, field	$5.1 * 10^{-6}$	9.142
Red meat	$5.0 * 10^{-6}$	8.828
Corn, sweet	$3.1 * 10^{-6}$	5.555
Pineapple	$5.0 * 10^{-7}$	0.884
Corn, pop	$1.0 * 10^{-7}$	0.185
Wheat	$6.2 * 10^{-8}$	0.110
Macadamia nuts	$4.4 * 10^{-10}$	0.001
Total --->	$5.6 * 10^{-5}$	100.000

Water:

DEB did not provide anticipated residues for water, and we will, therefore, not comment on how this anticipated residue could be further refined.

Sugarcane, Field Corn, Sweet Corn:

Anticipated residues for field corn (0.1 ppm), sweet corn (0.1 ppm), and sugarcane (0.13 ppm) were based on average residue values from field trial data which consisted primarily of non-detectable residues (the analytical method limit of detection (LOD) for parent atrazine is 0.1 ppm for most field trial data, 0.05 ppm for some data; the limits of detection for the 3 chloro-metabolites are 0.05 ppm for each metabolite). However, even based on an anticipated residue of 0.05 ppm, the oncogenic risk would still exceed 10^{-6} for each of these commodities separately (including their processed commodities). Therefore, requesting monitoring data utilizing measurement techniques at the current limits of detection would not provide any additional information as far as refining the risk estimates.

Two options are possible:

(1) The registrant could develop analytical methods capable of measuring residues of atrazine and its metabolites at lower levels. These levels (LODs) should be low enough that anticipated residues based on these levels would not lead to combined risks exceeding 10^{-6} (combined risks for all commodities plus water) as calculated by TAS. We estimate that this would require limits of detection at least one order of magnitude lower than available with the current analytical methods. We note that these LODs might have to be further decreased if the Q*, consumption, or the total toxic residue definition were modified (e.g., inclusion of hydroxy-

metabolites in the total toxic residue). A monitoring program would then be developed after development of adequate analytical methodology. This is the preferred option.

(2) If the registrant finds it impossible to attain the required limits of detection, limited field trial data could be provided utilizing radiolabelled atrazine. Since residues could be determined to a much lower level, anticipated residues could be based on detectable residues rather than on a conservative estimate based on the capabilities of the analytical method (current LODs of 0.05 to 0.1 ppm). A sufficient number of samples are required to reflect common commercial agricultural practices. Adequate geographical representation must also be demonstrated. Characterization of radioactivity might be necessary if total radioactivity exceeds acceptable exposure levels. Alternatively, an adequate metabolism study could be submitted which profiles the composition of the total radioactivity on each crop at PHIs, application rates, etc., corresponding to current registrations. We note that these types of data may be adequate for the purposes of dietary exposure estimates under some circumstances, but are not adequate for the purposes of establishing tolerances.

The registrant should submit a detailed protocol for review by DEB prior to initiation of any of these studies.

Milk, Red Meat

Anticipated residue levels have been provided for milk and red meat in the first two sections of this review.

cc: M. Metzger (DEB), Atrazine S.F., Reg Std File, R.F., R. Tomerlin (SACB/TAS), Circu (7), E. Eldredge (ISB/PMSD)
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